IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Application

Applicant(s):	Ahrens et al.
Case:	6-89-5-2
Serial No.:	09/516,268
Filing Date:	February 29, 2000
Group:	2874
Examiner:	Daniel E. Valencia

I hereby certify that this paper is being deposited on this date with the U.S. Postal Service as first class mail addressed to the Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

Signature: [signature] Date: January 8, 2004

Title: Method and Apparatus for Automatic Tracking of an Optical Signal in a Wireless Optical Communication System

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APPEAL BRIEF

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Applicants hereby appeal the final rejection dated October 17, 2003, of claims 1-4, 9-12, 17, and 18 of the above-identified patent application.

REAL PARTY IN INTEREST

The present application is assigned to Lucent Technologies Inc., as evidenced by an assignment recorded on May 12, 2000 in the United States Patent and Trademark Office at Reel 010790, Frame 0396. The assignee, Lucent Technologies Inc., is the real party in interest.

RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

STATUS OF CLAIMS

Claims 1 through 20 are pending in the above-identified patent application. Claims 1-4, 9-12, and 17-18 remain rejected under 35 U.S.C. §103(a) as being unpatentable over Laor (United States Patent Number 6,031,947). The Examiner has indicated that claims 5-8, 13-16, and 19-20 would be allowable if rewritten in independent form including all of the limitations of the base claims and any intervening claims.

STATUS OF AMENDMENTS

There have been no amendments filed subsequent to the final rejection.

SUMMARY OF INVENTION

The present invention is directed to a method and apparatus for aligning and maintaining the alignment of the transmitting unit and the receiving unit in an optical wireless communication system. The receiving unit includes an optical bundle positioned at the focal point of an objective optic element. The optical bundle is comprised of an array of optical fibers, arranged surrounding the receiving fiber. (Page 5, lines 9-24.) The receiving unit also includes a number of detectors that measure the optical signal strength on a corresponding fiber in the optical bundle. (Page 4, line 29, to page 5, line 8.) The array of fibers is used to detect the location of the received signal relative to the receiving optical fiber and to provide feedback to adjust the orientation of the optical bundle to optimize the received signal strength. When misalignment occurs between the received signal and the receiving fiber, some of the incident received signal will be captured by one or more of the outer optical fibers. (Page 5, line 25, to page 6, line 4.) The amplitude of each of the generated signals are then compared to each other, thereby giving a direction in which to drive the optical bundle back into alignment with the received signal. (Page 7, line 12, to page 8, line 10.) The present invention provides automatic tracking using the information-carrying optical signal, without the need for a separate laser.

ISSUES PRESENTED FOR REVIEW

Whether claims 1-4, 9-12, and 17-18 are properly rejected under 35 U.S.C. §103(a) as being unpatentable over Laor.

GROUPING OF CLAIMS

The rejected claims do not stand and fall together. More particularly, for the reasons given below, Applicant believes that each of the dependent claims 4/12/18 provide independent bases for patentability apart from the rejected independent claims.

ARGUMENT

Claims 1, 9, and 17 are rejected under 35 U.S.C. §103(a) as being unpatentable over Laor. In particular, the Examiner asserts that Laor discloses "a method of aligning fiber ends including using a bundle with a receiving fiber that analyzes the signal strengths of the surrounding fibers relative to the receiving fiber in order to detect the location and provide a feedback for precise alignment (col. 3, lines 14-24 and col. 5, lines 53-64)."

Applicants note that Laor is directed to aligning bundles of fibers containing control and communication signals. The *alignment of the control signals alone* is monitored and used to control the alignment of the bundles in order that *both* the control and communication receivers receive the maximum strength signal that can be achieved. Independent claim 1 requires "wherein an orientation of said receiving unit" is adjusted based on an "intensity of said optical communication signal received by said receiving fiber *relative* to an intensity of said optical communication signal received by said array of optical fibers." Independent claim 9, as amended, requires "wherein said array of optical fibers detects a location of said signal relative to said receiving fiber...based on an intensity of said optical communication signal received by said receiving fiber *relative* to an intensity of said optical communication signal received by said array of optical fibers." Independent claim 17 requires "repositioning said optical bundle *to reduce the signal strength in said fibers in said array of optical fibers and to increase the signal strength in said receiving fiber*."

Conclusion

Thus, Laor does not disclose or suggest repositioning the receiving fibers of an optical communication system based on an intensity of said optical communication signal received by said receiving fiber relative to an intensity of said optical communication signal received by said array of optical fibers, as required by independent claims 1 and 9, as amended, and does not disclose or suggest repositioning said optical bundle to reduce the signal strength in said fibers in said array of optical fibers and to increase the signal strength in said receiving fiber as required by independent claim 17.

The rejections of the independent claims under section §103 in view of Laor are therefore believed to be improper and should be withdrawn.

Dependent Claims

Claims 4, 12, and 18 specify a number of limitations providing additional bases for patentability. Specifically, the Examiner rejected claims 4, 12, and 18 under 35 U.S.C. §103(a) as being unpatentable over Laor. Claims 4, 12, and 18 require "wherein said receiving fiber is recessed relative to said array."

The Examiner acknowledges that Laor does not specifically state that the receiving fiber is recessed, but asserts that one of ordinary skill in the art would recognize that there are various reasons that one might recess a central fiber, for example, to insert a lens therein.

Applicants note that there is no requirement to insert a lens for a receiving fiber for the present invention. A person of ordinary skill in the art would therefore *not* have any reason to recess the receiving fiber. The specification of the present invention, however, discloses that, by recessing the central fiber, the optical signal arrives focused on the core of the receiving fiber and part of the optical signal will be captured by the surrounding fibers (even for perfect alignment). As the optical signal deviates from perfect alignment, additional signal strength will be measured by the surrounding fibers. (Page 6, lines 16-19.) Thus, there is a clear advantage to recessing the fiber even in the absence of the reasons known to one of ordinary skill in the art.

Thus, it would not have been obvious to one of ordinary skill in the art at the time of the invention to recess the receiving in the device disclosed by Laor, as required by claims 4, 12, and 18.

The remaining rejected dependent claims are believed allowable for at least the reasons identified above with respect to the independent claims.

The attention of the Examiner and the Appeal Board to this matter is appreciated.

Respectfully,

Date: January 8, 2004

Kevin M. Mason
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APPENDIX

1. An optical receiving unit for a wireless communications link, said optical receiving unit comprising:

a receiving unit including at least one objective optic element; and

an optical bundle operable to receive an optical communication signal, wherein said optical bundle is comprised of an array of optical fibers arranged surrounding a receiving fiber, wherein an intensity of said optical communication signal received by said receiving fiber relative to an intensity of said optical communication signal received by said array of optical fibers is used to adjust an orientation of said receiving unit.

2. The optical receiving unit of claim 1, wherein said array is comprised of N fibers and wherein N is selected to facilitate fabrication of said optical bundle.

3. The optical receiving unit of claim 1, wherein a core diameter and numerical aperture of said array of optical fibers are selected to capture as much light as possible.

4. The optical receiving unit of claim 1, wherein said receiving fiber is recessed relative to said array.

5. The optical receiving unit of claim 4, wherein said receiving fiber is recessed relative to said array by appending an extension bundle to said optical bundle to add additional length to each of said fibers in said array.

6. The optical receiving unit of claim 5, wherein said extension bundle is comprised of an array of fibers arranged around a central fiber and said central fiber is then removed from the extension bundle.

7. The optical receiving unit of claim 4, wherein said receiving fiber is recessed relative to said array by appending a silica disk to said optical bundle.

8. The optical receiving unit of claim 7, wherein said silica disk has a hole in the center and wherein an outer diameter of said silica disk is at least equal to the diameter of said optical bundle and an inner diameter of said silica disk is approximately equal to the core diameter of said receiving fiber.

9. An optical receiving unit for a wireless communications link, said optical receiving unit comprising:

a receiving unit including at least one objective optic element; and

an optical bundle operable to receive an optical signal, wherein said optical bundle is comprised of an array of optical fibers arranged surrounding a receiving fiber, wherein said array of optical fibers detects a location of said signal relative to said receiving fiber and provides feedback to adjust an orientation of said receiving unit based on an intensity of said optical communication signal received by said receiving fiber relative to an intensity of said optical communication signal received by said array of optical fibers.

10. The optical receiving unit of claim 9, wherein said array is comprised of N fibers and wherein N is selected to facilitate fabrication of said optical bundle.

11. The optical receiving unit of claim 9, wherein a core diameter and numerical aperture of said array of optical fibers are selected to capture as much light as possible.

12. The optical receiving unit of claim 9, wherein said receiving fiber is recessed relative to said array.

13. The optical receiving unit of claim 12, wherein said receiving fiber is recessed relative to said array by appending an extension bundle to said optical bundle to add additional length to each of said fibers in said array.

14. The optical receiving unit of claim 13, wherein said extension bundle is comprised of an array of fibers arranged around a central fiber and said central fiber is then removed from the extension bundle.

15. The optical receiving unit of claim 12, wherein said receiving fiber is recessed relative to said array by appending a silica disk to said optical bundle.

16. The optical receiving unit of claim 15, wherein said silica disk has a hole in the center and wherein an outer diameter of said silica disk is at least equal to the diameter of said optical bundle and an inner diameter of said silica disk is approximately equal to the core diameter of said receiving fiber.

17. A method of aligning an optical receiving unit with an optical transmitting unit in a wireless communications link, said method comprising:

receiving an optical signal using an optical bundle comprised of an array of optical fibers arranged surrounding a receiving fiber;

measuring a signal strength of said optical signal in each fiber in said array of optical fibers and in said receiving fiber; and

repositioning said optical bundle to reduce the signal strength in said fibers in said array of optical fibers and to increase the signal strength in said receiving fiber.

18. The method of claim 17, further comprising the step of recessing said receiving fiber relative to said array.

19. The method of claim 18, further comprising the step of appending an extension bundle to said optical bundle to add additional length to each of said fibers in said array.

20. The method of claim 18, further comprising the step of appending a silica disk to said optical bundle.

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Applicants note that there is no requirement to insert a lens for a receiving fiber for the present invention. A person of ordinary skill in the art would therefore *not* have any reason to recess the receiving fiber. The specification of the present invention, however, discloses that, by recessing the central fiber, the optical signal arrives focused on the core of the receiving fiber and part of the optical signal will be captured by the surrounding fibers (even for perfect alignment). As the optical signal deviates from perfect alignment, additional signal strength will be measured by the surrounding fibers. (Page 6, lines 16-19.) Thus, there is a clear advantage to recessing the fiber even in the absence of the reasons known to one of ordinary skill in the art.

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3. The optical receiving unit of claim 1, wherein a core diameter and numerical aperture of said array of optical fibers are selected to capture as much light as possible.

4. The optical receiving unit of claim 1, wherein said receiving fiber is recessed relative to said array.

5. The optical receiving unit of claim 4, wherein said receiving fiber is recessed relative to said array by appending an extension bundle to said optical bundle to add additional length to each of said fibers in said array.

6. The optical receiving unit of claim 5, wherein said extension bundle is comprised of an array of fibers arranged around a central fiber and said central fiber is then removed from the extension bundle.

7. The optical receiving unit of claim 4, wherein said receiving fiber is recessed relative to said array by appending a silica disk to said optical bundle.

8. The optical receiving unit of claim 7, wherein said silica disk has a hole in the center and wherein an outer diameter of said silica disk is at least equal to the diameter of said optical bundle and an inner diameter of said silica disk is approximately equal to the core diameter of said receiving fiber.

9. An optical receiving unit for a wireless communications link, said optical receiving unit comprising:

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an optical bundle operable to receive an optical signal, wherein said optical bundle is comprised of an array of optical fibers arranged surrounding a receiving fiber, wherein said array of optical fibers detects a location of said signal relative to said receiving fiber and provides feedback to adjust an orientation of said receiving unit based on an intensity of said optical communication signal received by said receiving fiber relative to an intensity of said optical communication signal received by said array of optical fibers.

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measuring a signal strength of said optical signal in each fiber in said array of optical fibers and in said receiving fiber; and

repositioning said optical bundle to reduce the signal strength in said fibers in said array of optical fibers and to increase the signal strength in said receiving fiber.

18. The method of claim 17, further comprising the step of recessing said receiving fiber relative to said array.

19. The method of claim 18, further comprising the step of appending an extension bundle to said optical bundle to add additional length to each of said fibers in said array.

20. The method of claim 18, further comprising the step of appending a silica disk to said optical bundle.